PATENT SPECIFICATION

806,810

Date of application and filing Complete Specification: Aug. 17, 1955.

No. 23687/55.

Application made in United States of America on Sept. 15, 1954.

Complete Specification Published: Dec. 31, 1958.

Index at acceptance:—Class 110(3), B2(B2: B3: K).

International Classification:—F02c.

COMPLETE SPECIFICATION

Improvements in or relating to a Turbine Wheel for a Gas Turbine Engine

We, CHRYSLER CORPORATION, a Corporation organised under the laws of the State of Delaware, United States of America, of 341, Massachusetts Avenue, Highland Park, Detroit, Michigan, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to turbine wheels for use in gas turbine engines.

The present disclosure is particularly directed to a turbine wheel construction which has certain features that are common to the constructions disclosed in co-pending British patent application 4905/55 (Serial No. 802,667) but which is further characterized by a central hub formed integrally with the inner turbine wheel disc portion. This integral assembly is adapted to be rotatably mounted in suitable bearing structure forming a portion of the gas turbine engine with which the turbine wheel is to be used.

The integral formation of the turbine wheel hub and inner disc portion referred to above results in a relatively rapid dissipation of heat from the body of the turbine wheel disc which in turn reduces thermal distortion and warping. Also the total combined stresses at the location of maximum stress will tend to be reduced because of a corresponding reduction in the thermal stress component.

Other advantages residing in the integral hub and disc assembly of the instant invention are the simplicity in design, the relatively low manufacturing cost and the greatly improved structural rigidity.

Like the turbine wheel assemblies disclosed in co-pending application 4905/55 (Serial No. 802,667) the design of the present invention is such that the dynamic and thermal stresses may be strategically distributed to the best advantage. Further, the present design, like that of the co-pending application, permits efficient use of each of two dissimilar metals in its construction and is adapted to take advantage of the more desirable physical properties of each metal.

According to the invention, there is provided a turbine wheel for a gas turbine engine comprising a central hub adapted to be mounted on a turbine shaft, a disc coaxial with said hub and extending radially outwardly therefrom, said disc having an inner portion integral with said hub and having an outer portion carried by said inner portion to comprise a unitary structure therewith, the axial thickness of said disc decreasing radially from adjacent said hub to a region of minimum thickness adjacent the outer periphery of said disc, said disc terminating in an axially enlarged peripheral base ring integral with said outer portion, and a plurality of blades carried by said base ring, the juncture between said inner and outer portions being radially inwardly of said region of minimum axial thickness.

In order that the invention may be understood, it will now be described with reference to the accompanying drawings in which:—

Figure 1 is a turbine wheel construction having an integrally cast hub and inner disc portion; and

Figure 2 is another form of the construction shown in Figure 1.

In the turbine wheel design of Figure 1, a central hub portion 79 is integrally formed on the radially disposed inner disc portion 80 to form a unitary, rigid assembly. The hub portion 79 may be centrally bored, as shown at 81, for the purpose of securing a turbine shaft or bolt 82. A nut 83 may be threadedly received on one end of the shaft 82 for the purpose of clamping the wheel assembly against suitable backup structure which may form a portion of the turbine wheel mounting means. The axial thickness of the disc in this embodiment as well as in that shown in Fig. 2 decreases radially from

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adjacent the hub to a region of minimum thickness adjacent the outer periphery of said disc.

A peripheral rim portion 84 may be brazed, preferably by the method known under the registered Trade Mark "Nicrobraze", at 85 to the outer peripheral edge of the inner disc portion 80, said rim portion 84 comprising an axially enlarged peripheral base ring 86 integral with the outer disc portion and integrally cast blades 88 formed thereon. However, we contemplate that the rim portion may alternatively be welded to the inner disc portion 80 or otherwise secured thereto as desired.

The integral rim portion 84 may be formed of a metal known under the registered Trade Mark "Stellite" or other suitable material and by preference, it may be made by an investment casting operation. However, we contemplate that the rim portion 84, like the corresponding rim portion of the construction shown in co-pending application 4905/55 (Serial No. 802,667) may be made by a sintering operation or by a suitable machining operation. The integral hub and inner disc portion of the constructions shown in Figures 1 and 2 may be formed by either a forging or a casting operation. The inner portion 80 of the disc and the integral hub portion 79 may be formed of a high strength, ductile metal. The advantages in using such dissimilar metals in forming the hub and inner disc portion and the rim portion have been set forth above in co-pending application 4905/55 (Serial No. 802,667). The juncture between the inner and outer disc portions is disposed radially inwardly of the region in which the disc has said minimum axial thickness.

Under some circumstances it may be desirable to integrally form the outer or rim portion and the outer disc portion, as shown in Figure 2, said outer disc portion being designated by the numeral 80^1 and the rim portion being designated by the numeral 84^1. The hub portion, shown at 79^1, is integrally formed with a modified inner disc portion 80^{11}, which may be "Nicrobrazed" or welded to the outer disc portion 80^1 at a radially inward location shown at 85^1. In all other respects, the constructions of Figures 1 and 2 may be identical. The rim portion 84^1 and the outer disc portion 80^1 like the rim portion 84 of Figure 1, are formed of "Stellite" or some other suitable metal, and the modified inner disc portion 80^{11} and the hub portion 79^1 are formed of a high strength metal.

WHAT WE CLAIM IS:—

1. A turbine wheel for a gas turbine engine comprising a central hub adapted to be mounted on a turbine shaft, a disc coaxial with said hub and extending radially outwardly therefrom, said disc having an inner portion integral with said hub and having an outer portion carried by said inner portion to comprise a unitary structure therewith, the axial thickness of said disc decreasing radially from adjacent said hub to a region of minimum thickness adjacent the outer periphery of said disc, said disc terminating in an axially enlarged peripheral base ring integral with said outer portion, and a plurality of blades carried by said base ring, the juncture between said inner and outer portions being radially inwardly of said region of minimum axial thickness.

2. A turbine wheel as claimed in Claim 1 wherein the juncture between said inner and outer portions is adjacent said region of minimum axial thickness.

3. A turbine wheel as claimed in Claims 1 or 2 wherein said inner and outer portions have mating annular surfaces brazed together at a region adjacent said region of minimum axial thickness.

4. A turbine wheel as claimed in any of the preceding claims wherein said outer portion and ring comprise a unitary sub-assembly of comparatively heat resistant metal, and said hub and inner portion comprise a second unitary sub-assembly of another type of metal.

5. A turbine wheel as claimed in any of the preceding claims wherein said outer portion, ring, and blades comprise an integral sub-assembly of sintered metal, and said hub and inner portion comprise an integral sub-assembly of relatively ductile metal.

6. A turbine wheel as claimed in any of the preceding claims wherein said hub has a cylindrical outer surface adapted to be rotatably mounted in bearing structure.

7. A turbine wheel for a gas turbine engine constructed and arranged substantially as described and shown in the accompanying drawings.

STEVENS, LANGNER, PARRY & ROLLINSON,
Chartered Patent Agents,
Agents for the Applicants.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1958.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

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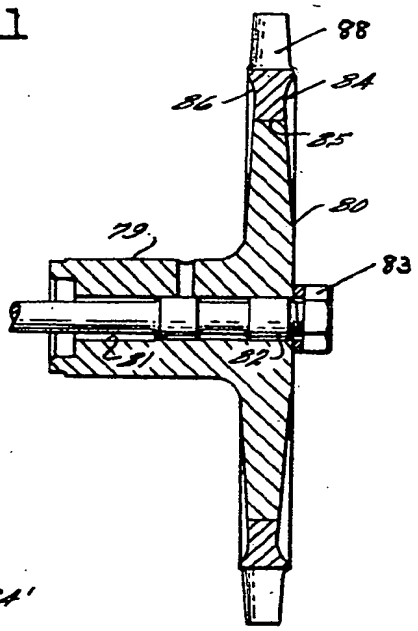
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

FIG. 1



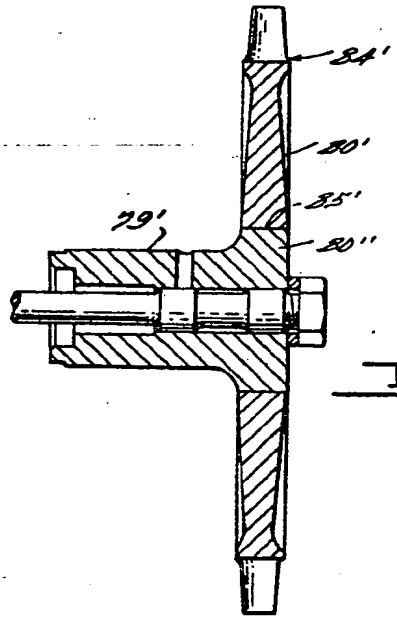


FIG. 2.